Army Service Forces
Quartermaster Corps
CLIMATIC RESEARCH LABORATORY
Lawrence, Massachusetts

Monthly Report - 1 August 1944

1. The following reports have been sent to the Office of The Quartermaster General for the approval of Colonel G. F. Doriot.

Report No. 110 - 10 July 1944
Jackets, Field, Pile, Experimental
Effect of Laundering on Thermal Insulation and Other Physiological Properties.
Six Tables and One Figure

This report is based upon a study of the effect of one and three launderings upon the size, "feel" and thickness under load of Jackets, Field, Pile, made from one each of five types of pile and a comparison of the thermal insulation of three of the types prior to and after one and three launderings.

The type numbers and descriptions of the pile jackets studied were as follows:

Type Number	Description
33	1/2" 100 percent wool, double-faced, od
34	1/2" 100 percent wool, single-faced, od
35	1/2" 50 percent wool, 50 percent alpaca, double-faced
36	3/8" 50 percent wool, 50 percent alpaca, single-faced
37	1/2" 50 percent alpaca, 50 percent mohair (Textile Spec. PQD 310A)

Each jacket had a poplin cover, but no liner.

The thermal insulation of the 100 percent wool pile jackets and the standard alpaca-mohair pile jackets was compared in the Cold Room prior to and after one and three launderings. All exposures were at plus 30°F. Tolerance times and skin temperatures were measured in the usual manner. These tests showed the 100 percent wool, double and single-faced pile jackets to be significantly warmer than the standard pile jacket, but failed to differentiate between the two 100 percent wool pile jackets. However, the trends favored the double-faced wool pile. Laundering had no significant

effect upon the two wool pile jackets, but did produce a significant increase in the thermal insulation of the standard pile jacket.

Laundering of the various types of pile jackets produced slight shrinkage in each item, but no significant difference between the various types was detected in this regard. After laundering the 100 percent wool single-faced pile showed considerable balling and matting, while the 100 percent wool double-faced pile showed only slight matting. The 50 percent wool - 50 percent alpaca piles showed considerable loss of sheen after laundering. The standard alpaca-mohair pile (type No. 37) appeared unchanged except for a somewhat coarser "feel".

Compressometer studies on the five types of pile before and after one and three launderings showed the 100 percent wool double-faced pile to be the thickest and the standard alpaca-mohair pile the thinnest. The 50 percent wool - 50 percent alpaca pile, single and double-faced, occupied an intermediary position. None of the piles was thinner after laundering than it was before.

It is concluded that either of the 100 percent wool piles is preferred to the standard alpaca-mohair pile. The double-faced wool pile was a shade better than the single-faced wool pile. The tolerance times in the double-faced wool tended to be slightly longer but not significantly so. The thickness of the double-faced pile was slightly greater and the matting and felting after laundering was slightly less.

Report No. 111 - 18 July 1944
Mitten Shell, Trigger-Finger, M-1943, Modified, Standard and Experimental Items.
Thermal Insulation, Moisture Uptake and Utility
Nine Tables and Four Figures

This test concerns the thermal insulation, moisture penetration and utility of four types of mitten shells, each similar to the Mitten Shell, Trigger-Finger, M-1943. Each type was equipped with an improved endless strap closure on the dorsum of the mitten and on the gauntlet. Type 3 was identical with the standard Mitten Shell, Trigger-Finger, M-1943, except for the strap closures. Type 4 was designed with a leather back as well as a leather palm. The leather was finished on one side only with polyacrylate. Type 5 had a pile back which included the back of the trigger-finger. The leather palm was treated with polyacrylate on one side only. Type 6 had cloth parts of Shirley Cloth rather than Sateen, and the leather palm was finished on both sides with polyacrylate.

The thermal insulation of the four types of mitten shells when dry was studied at plus 30°F., in relatively quiet air and in a 12-15 mph. wind. In the dry experiments there was no significant difference in protection between the several types of mittens. This lack of difference is consistent with the generalizations on limits of protection provided by conventional unheated handgear presented in Report No. 76-A from this laboratory. Quoting

from this report: "the physical laws of heat conduction through fabrics impose an upper limit on the protection against cold afforded by gloves and mittens. This upper limit has been reached by the best present handgear".

The moisture penetration of the four types of mitten shells was studied during passive exposure to rain and mist, during wear in rain and for the handling of wet objects. Each type of mitten allowed relatively little moisture to penetrate to the wool insert when passively exposed, but showed considerable moisture penetration when worn in rain and during the handling of wet objects. It was apparent that leakage of the mittens was facilitated by the movement of the hands and mittens and by pressure on wet objects.

Manual dexterity tests in which the bolt assembly test, described in Report No. 72-C, was employed, failed to reveal any difference between the four types of mittens.

No consistent, statistically significant and clearly defined preference for any of the experimental types of mittens could be established. Each type appeared to be essentially the same in performance under the various phases of the test. One serious but easily remediable defect in all four types was the new endless strap closure. This closure is basically a great improvement, but as designed at present, it cannot be tightened sufficiently to provide a snug closure over the back of the wrist and at the cuff.

It was concluded that further efforts should be made to develop a mitten shell with a more effective waterproof leather palm, with waterproof seams and with an improved strap closure. In view of these conclusions, procurement of the present standard model mitten shells should be continued until more satisfactory experimental items are developed and tested.

Report No. 103 - 26 July 1944
Experimental Jackets and Trousers, Cotton, od, Water-Repellency
Fourteen Tables and Two Figures

An inquiry into the water-repellent properties of twelve types of experimental jackets similar to Jacket, Field, M-1943, and seven types of experimental trousers similar to Trousers, Field, Cotton, od., has been completed. The data were largely collected in the course of physiological experiments in which the test garments were worn by soldiers during the exposure period. In the accumulation of a sufficient number of observations for statistical consideration of certain important aspects of this problem, approximately four hundred individual exposures in the field or in the laboratory were made by the test subjects. A majority of the exposures were made in the All Weather Chamber in the laboratory under controlled conditions of heavy rain and wind. One series of experiments was conducted in the field during a light rain. The results in the field were consistent with the comprehensive data collected in the test chamber.

A variety of fabrics, either treated for water-repellency or untreated, were represented in the Test Items. Four kinds of fabrics were used in the construction of seven types of experimental trousers. All but one of these had been specially treated with Zelan for water-repellency. Among the jackets, a varied assortment of single and double-layered items had been prepared utilizing several combinations of four kinds of fabrics. Two types of jackets had been Resin treated for water-repellency; the remaining ten were finished with Zelan.

The motif in this study was the determination of the moisture pickup by the experimental items as well as the moisture penetration into the underlying garments, shirts and trousers, respectively, during exposure to rain. Since comparative water-repellency, per se, was of primary concern, experimental conditions were maintained as constant as possible. The procedure in most experiments required that the soldiers walk about in the torrential downpour in order to simulate guard duty during a driving rain. In one series of experiments packs and web equipment were carried; in another series, the soldiers were exposed to moisture by having them lie on wet ground. In the remaining experiments the jackets and trousers were not covered by any accessory gear in order that the maximum surface area of the test item would be exposed to the artificial elements.

Each of the experimental items was first studied in an unlaundered and relatively unused state. After this phase had been completed, four representative types of jackets and trousers, of which there were an adequate number on hand, were investigated after having been laundered one and three times, respectively. The effect of wear upon water-repellency, except from that contingent upon experimental use and as a result of laundering, was not investigated.

A sufficient number of statistically significant comparative results were obtained to permit specific conclusions to be drawn. Among the three types of Shirley Cloth provided, the type of weave or the orientation of it in the garment did not appear to be an important factor insofar as the water-repellency of the item was concerned. Each Shirley fabric was Zelan treated and each was a superior item in one capacity or another. A comparison of Zelan treated Shirley Cloth either with a Resin treatment or untreated was not possible since only Zelan treated items of this fabric were provided for study.

The best performance in a majority of the tests was made by the Zelan treated Shirley Cloth, Double-Layered, Field Jacket, Code No. F-1652, and the Zelan treated, Shirley Cloth Trousers, Code No. E-1158. Since representative types only were investigated after laundering, due to the limited number available, favorable statements about certain types do not necessarily imply an unfavorable performance by other types not tested. Thus, F-1655 Jacket, which was only slightly inferior to F-1652 unlaundered, might have performed in a similar manner if it had been studied laundered, instead of F-1652. This point is probably of no great practical significance and if a

Shirley Cloth is selected as a fabric for the Jacket, Field, M-1943, other factors than a slight difference in water-repellency would probably determine whether F-1652 or F-1655 would be procured.

Among the trousers, the Shirley fabric E-1158, had no close competitor. Among the field jackets, the Resin treated, 9-ounce Sateen; 5-ounce Poplin Liner, Code No. H, was similar to F-1652 in most of the tests. Jacket H was slightly better than the Zelan treated jacket of a similar fabric construction, Code No. B. All Zelan treated garments showed evidence of some loss of water-repellency following laundering. No such deterioration was observed in the one Resin treated type that was investigated.

2. In the Provisional Reports during the past month, tests on the following items were discussed:

Thermal Insulation of Footgear as Determined by Bronze Foot.
Vapor Barrier Sockgear
Various Uniform Assemblies, Clo Values
Tent, Poncho, M-1944
Mask, Field, Pile
Footgear, Traction
Bag, Clothing, Waterproof
Opener, Can, Individual
Bag, Sleeping, Air Evacuation
Supplementary Knee Protection to Zone 2 Uniform Assembly
Underwear, Thermal Insulation
Pads, Sleeping
Bag, Waterproof, Special Purpose
Windshield, Glass Cloth, for Cookset, Mountain
Simplification of Rain Protection

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